

REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Status of Claims:

No claims are currently being added or cancelled.

Claims 1 and 5 are currently being amended.

This amendment and reply amends claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claims remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1-6 are pending in this application for examination on the merits, whereby claims 7-14 are withdrawn from consideration.

Claim Rejections – Prior Art:

In the final Office Action, claims 1-6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Publication No. 2003/0148623 to Ohmi et al. in view of U.S. Patent Publication No. 2002/0043341 to Kanetsuki et al. and U.S. Patent Publication No. 2005/0211702 to Gigl et al. and U.S. Patent No. 6,203,620 to Moslehi. This rejection is traversed with respect to the presently pending claims under rejection, for at least the reasons given below.

In the final Office Action, the Moslehi reference is newly cited from the rejections made in the previous Office Action, and the comments provided below will be primarily with respect to the Moslehi reference. Page 4 of the final Office Action asserts that Moslehi teaches a cover plate/middle dielectric plate (#306, col. 13, lines 63-64) having projections (portion #316, col. 13, line 58) directed to the shower plate (#318, col. 13, line 47) with a space (dispersion cavities #316's, col. 13, line 56-61) left between the cover plate and the shower plate (as shown in Fig. 5, similar to the space shown in Fig. 1 of instant Application).

Herein, please note that Moslehi is related to an inductively-coupled plasma (ICP) source which essentially includes coil segments, as pointed out in the final Office Action, and the middle dielectric plate #306 as shown in Figure 5 of Moslehi is illustrated in detail in Figures 7 and 8 of Moslehi. As shown in Figure 7 of Moslehi, the middle dielectric plate 306 is made of a suitable thermally conductive and electrically insulating substrate material which includes passageway 326, plate bonding junctions 324, showerhead zone dispersion cavities 316, and trenches 328.

The trenches 328 are filled with conductors, such as aluminum or copper, so as to provide broken ring-shaped coil turns. In addition, the plate bonding junctions 324 can be formed within hermetic sealing trenches and form continuous concentric rings between the adjacent gas dispersion cavities on the bottom surface and multi-zone ICP antenna segments on the top surface (see column 15, lines 2 to 6 of Moslehi).

Moreover, the showerhead zone dispersion cavities 316 form continuous concentric rings around optical plug hole 326 on the bottom surface of the middle dielectric plate 306 (see column 14, line 66 to column 15, line 2 of Moslehi). Thus, the shower head zone dispersion cavities 316 are arranged in a concentric and continuous configuration, and such arrangement of the cavities 316 are concerned with a configuration of the coils necessary for the ICP source. The concentric and continuous arrangement of the cavities 316 is clearly and completely different from the arrangement of cylindrical projections as recited in claim 1.

In other words, Moslehi does not teach or suggest the arrangement of cylindrical shaped projections as explicitly recited in presently pending independent claim 1.

Also, please note that the plasma processing apparatus according to the present invention does not have a coil, as illustrated in Figures 2 and 4 of the drawings, and is specified by a cover plate which has a large number of cylindrical shaped projections (as described on page 8, lines 12 to 14 of the specification) directed to the shower plate. Such arrangement of the cylindrical shaped projections brings about a space of a non-concentric configuration or an irregular shape between the cover plate and the shower plate, as shown in Figures 2 and 4 of the drawings.

In addition, Moslehi does not teach or suggest that a non-concentric space defined by the cylindrical shaped projections serves to suppress an abnormal discharge in the space left between the cover plate and the shower plate. In other words, Moslehi does not teach or suggest anything concerning a relationship between a contour of each projection and the abnormal discharge which otherwise might occur in the space between the cover plate and the shower plate.

Kanetsuki et al. teaches generation of plasma in an unwanted location which takes place in reactive gas channel 115 (see paragraph 0015). In addition, Kanetsuki et al. shows an internal wall surface of a chamber lid 1 in Figure 5 of that reference, and has a recess or space formed in the internal wall surface (see paragraph 0054). The recess and one surface of metal plate 16 form a reactive gas channel 15 that is a reactive gas supply passage.

However, the illustrated reactive gas channel 15 in Figure 5 of Kanetsuki et al. is rectangular in shape and is not cylindrical.

Moreover, Ohmi et al. discloses a plasma processing apparatus in which an abnormal discharge on the face of the radial line slot antenna is eliminated (see paragraph 0022). To this end, Ohmi et al. proposes an improvement of a coaxial waveguide. Specifically, an outer waveguide of the coaxial waveguide is coupled to a second outer surface of a microwave antenna while a center conductor of the coaxial waveguide forms capacitive coupling with a first outer surface of the microwave antenna (see paragraphs 0031, 0032).

No consideration is made at all in Ohmi et al. about an improvement of a cover plate and about arrangement of cylindrical shaped projections on the cover plate.

Gigl et al. is not pertinent as a reference because the filing date of Gigl et al. is after the filing date of the present invention, and whereby Applicants reserve the right to overcome this reference by perfecting their priority date of December 26, 2003.

At any rate, all of the cited references, alone or in combination, do not teach or suggest anything concerning adjusting relative dielectric constants between a shower plate and a cover plate in order to avoid an abnormal discharge, and about configurations of projections formed on a cover plate.

In marked contrast, the present invention as exemplified by independent claim 1 is directed to an arrangement of cylindrical shaped projections on a cover plate so as to suppress local electric field concentration in a space between a shower plate and the cover plate. Moreover, the present invention forms both the shower plate and the cover plate by materials different in relative dielectric constant from each other (see claims 2-4, for example). For example, claims 2 and 3 recites that the cover plate is formed by a material which is smaller in relative dielectric constant than that of the shower plate, whereby this structure is helpful to suppress an abnormal discharge between the cover plate and the shower plate.

Accordingly, presently pending independent claims 1 and 5 (which has been amended in a manner somewhat similar to the amendments made to claim 1, discussed above) are patentable over the combined teachings of Ohmi, Kanetsuki et al., Gigl et al. and Moslehi.

Conclusion:

Since all of the issues raised in the Office Action have been addressed in this Amendment and Reply, Applicant believes that the present application is now in condition for allowance, and an early indication of allowance is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing or a credit card payment form being unsigned, providing incorrect information resulting in a rejected credit card transaction, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741.

If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorize payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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